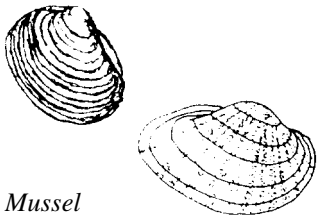
Taxonomic Key to Benthic Macroinvertebrates

The purpose of this taxonomic key is to assist volunteer monitors, who are not trained in taxonomy, with the identification of benthic macroinvertebrates found in Indiana. This key is a simplified version of more complex keys. The taxonomic level of this key is intended for use by citizen monitoring groups. When using this key please note that each couplet offers two or three options. Each couplet is numbered and the numbers in bold refer to the next couplet (the next set of numbers that you proceed to).

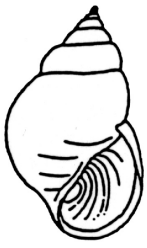
Please be aware that some macroinvertebrates may have missing body parts so you should look at more than one organism!

CHOOSE ONE:		**GO BELOW TO:**
(1)a	Has a shell(s)	**2**
(1)b	Has no shell	**5**
(2)a	Has a hinged double shell	**3**
(2)b	Has a single shell	**4**
(3)a	Adult under 2 inches long	**19**
(3)b	About 2-4 inches long	MUSSEL



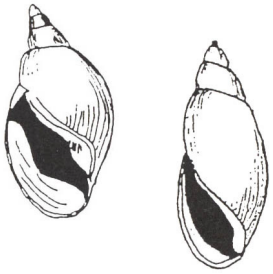
Mussel

(4)a	Right-handed opening	RIGHT-HANDED SNAIL



Right-Handed Snail

(4)b	Left-hand opening	LEFT-HANDED SNAIL

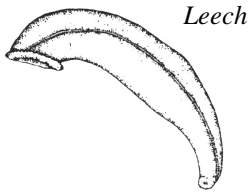


Left-Handed Snail

CHOOSE ONE:		GO BELOW TO:
(5)a	Has a segmented body or looks like a tiny tick	**6**
(5)b	Has an unsegmented body and has an "arrow shaped" head; 2 pigment spots (eyes)	PLANARIA

Planaria

(6)a	No obvious legs	**7**
(6)b	Obvious legs	**12**
(7)a	Has no obvious appendages (long, tubular body)	**8**
(7)b	Has some appendages (small tubes, tiny bumps, or feathery structures)	**9**
(8)a	Has a smooth body and suckers	LEECH

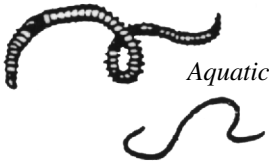


Leech

(8)b	Has a round body and a rat tail	RAT-TAILED MAGGOT

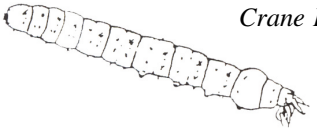
Rat-Tailed Maggot

(8)c	Has a rounded body	AQUATIC WORMS



Aquatic Worms

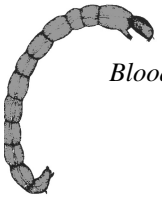
(9)a	Body black or brown; more than 1/3 inch long; plump and catepillar-like	CRANE FLY LARVA

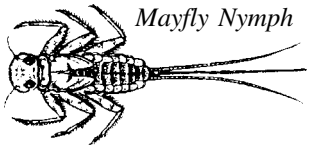
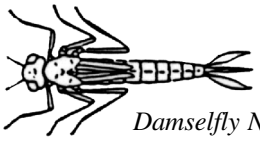
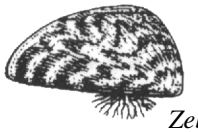
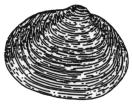


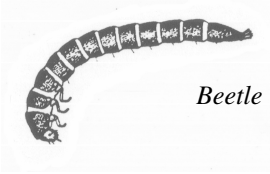
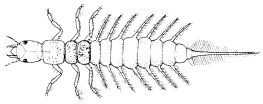
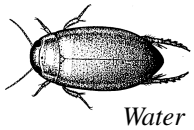
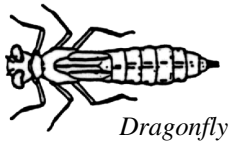
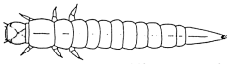
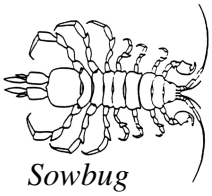
Crane Fly Larva

(9)b	Has a distinct head	**10**
(10)a	One end of body wider than other end; two tiny feather structures on smaller end	BLACK FLY LARVA

Black Fly Larva

CHOOSE ONE:		GO BELOW TO:
(10)b No difference in diameter along body		**11**
(11)a Bright red body	 *Blood Midge*	BLOOD MIDGES
(11)b Grey Body		OTHER MIDGES
(12)a Has four pairs of legs	 *Water Mite*	WATER MITE
(12)b Has three pairs of legs		**13**
(12)c Has many pairs of legs		**26**
(13)a Has no wings or short wing pads on back		**14**
(13)b Has two pairs of wings that cover the abdomen		**23**
(14)a Has a flat, round body with legs underneath (wings are not obvious)	 *Water Penny*	WATER PENNY BEETLE LARVA
(14)b Not flat, has long body with legs		**15**
(15)a Lives in a tube or a case or has two hooks in its last segment and is green with 3 plates on back behind head. (The "green caddisfly" builds a net & tube, but will be washed into the kick net as "free living")	 *Caddisfly Larva* 	CADDISLY LARVA
(15)b Free-living		**16**

CHOOSE ONE:		**GO BELOW TO:**
(16)a Abdomen possesses lateral filaments similar in size to legs		**21**
(16)b Abdomen does not have "leg-like" filaments (may have feathery "gills")		**17**
(17)a Always with only two tail appendages and no abdominal gills	 *Stonefly Nymph*	STONEFLY NYMPH
(17)b Usually has three tail appendages, and with no lateral gills on abdominal segments		**18**
(17)c Tail has no appendages		**25**
(18)a Has long, bristle-like tail appendages, sometimes 2 or 3	*Mayfly Nymph* 	MAYFLY NYMPH
(18)b Lower lip formed into extensible scoop-like structure and has leaf-like tail appendages	 *Damselfly Nymph*	DAMSELFLY NYMPH
(19)a Small rounded shell (< 2 inches)		**20**
(19)b Small triangular shell with alternating cream and dark brown bands	 *Zebra Mussel*	ZEBRA MUSSEL (EXOTIC)
(20)a Numerous very fine concentric rows of elevated lines, white or cream colored, with smooth lateral teeth (ridge lines on inside near point)	 *Fingernail Clam*	FINGERNAIL CLAM
(20)b Numerous concentric elevated ridges, yellowish brown to black shell with serrated lateral teeth	 *Asiatic Clam*	ASIATIC CLAM (EXOTIC)

CHOOSE ONE:		**GO BELOW TO:**
(21)a Head narrower than widest body segments	 *Beetle larva*	BEETLE LARVA
(21)b Head as wide or wider than other body segments		**22**
(22)a Abdomen with single long filament at end	 *Alderfly*	ALDERFLY
(22)b Abdomen ending with a pair of tiny hooked legs, large head with pincer-like jaws	 *Dobsonfly Larva*	DOBSONFLY OR FISHFLY
(23)a Oval shaped body, legs with feathery swimming hairs	 *Water bug*	ADULT WATER BUGS AND WATER BEETLES
(23)b All legs smooth, without hairs, crawling	 *Riffle Beetle Adult*	RIFFLE BEETLE ADULT
(25)a Lower lip formed into scoop like structure	 *Dragonfly Nymph*	DRAGONFLY NYMPH
(25)b Looks like a tiny millipede	 *Riffle Beetle Larva*	RIFFLE BEETLE LARVA
(26)a Flattened top to bottom, crawling looks like "roly-poly" or a "pill bug"	 *Sowbug*	SOWBUG
(26)b Flattened side to side, swimming looks like tiny shrimp	 *Scud or Side-swimmer*	SCUD

How to Complete the Biological Monitoring Data Sheet

The first portion of the Biological Monitoring Data Sheet is the information section. For instructions on how to complete this section, see pages 111-112 in Chapter 7 Data Reporting.

Sampling Procedures

Equipment: Check one or both of the nets used to collect macroinvertebrate sample.
Habitat: Check each type of habitat sampled during this survey.

Pollution Tolerance Index

The macroinvertebrate index is divided into Pollution Tolerance Groups (PT Group) 1,2,3 and 4. These PT groups represent the different levels of pollution tolerance. The higher the group number, the higher the pollution tolerance level. Record the number of macroinvertebrates you find here.

PT GROUP 1 *Intolerant*		PT GROUP 2 *Moderately Intolerant*		PT GROUP 3 *Fairly Tolerant*		PT GROUP 4 *Very Tolerant*	
Stonefly Nymph	6	Damselfly Nymph		Midge Larvae	>100	Left-Handed Snail	1
Mayfly Nymph		Dragonfly Nymph	5	Black Fly Larvae		Aquatic Worms	5
Caddis Fly Larvae	10	Sowbug		Planaria	16	Blood Midge	
Dobsonfly Larvae		Scud		Leech		Rat-tailed Maggot	
Riffle Beetle		Crane Fly Larvae					
Water Penny	30	Clams/Mussels					
Right-Handed Snail		Crayfish	2				

The next row is the # of Taxa. Insects that have the same body shape all belong to the same taxa (see the back of your PTI macroinvertebrate data sheet for general body shape/taxa). To find the total number of taxa for each PT Group you need to add the number of types of organisms. It is possible to have a particular PT group without any numbers, therefore it will score a zero.

Do not make the mistake of adding the numbers of organisms together.

# of TAXA	3	# of TAXA	2	# of TAXA	2	# of TAXA	2

The next row is the group scores. Multiply each # of taxa by its weighting factor.

# of TAXA	3	# of TAXA	2	# of TAXA	2	# of TAXA	2
Weighting Factors: (x 4)	12	(x 3)	6	(x 2)	4	(x 1)	2

Note: The Volunteer Stream Monitoring Internet Database (described in Chapter 7) will perform these calculations for you when you submit data.

Then total all of the group scores to get the POLLUTION TOLERANCE INDEX RATING.

# of TAXA	3	# of TAXA	2	# of TAXA	2	# of TAXA	2
(x 4)	12	(x 3)	6	(x 2)	4	(x 1)	2

23 +	Excellent
17 - 22	Good
11 - 16	Fair
10 or Less	Poor

POLLUTION TOLERANCE INDEX RATING
(Add the final index values for each group.) 24

Other Biological Indicators

Check the appropriate box if you find native mussels, zebra mussels, rusty crayfish or submerged aquatic plants at your site. Estimate the percentage of rocks or the stream bottom covered by algae at your site. Write your Diversity Index score if you perform the procedures described on pages 107-108.

Other Biological Indicators

☐ Native Mussels ☐ Zebra Mussels ☐ Rusty Crayfish ☒ Aquatic Plants 25 % Algae Cover .75 Diversity Index

Example of a complete Pollution Tolerance Index:

POLLUTION TOLERANCE INDEX (PTI)

PT GROUP 1 *Intolerant*		PT GROUP 2 *Moderately Intolerant*		PT GROUP 3 *Fairly Tolerant*		PT GROUP 4 *Very Tolerant*	
Stonefly Nymph	6	Damselfly Nymph		Midge Larvae	>100	Left-Handed Snail	1
Mayfly Nymph		Dragonfly Nymph	5	Black Fly Larvae		Aquatic Worms	5
Caddis Fly Larvae	10	Sowbug		Planaria	16	Blood Midge	
Dobsonfly Larvae		Scud		Leech		Rat-tailed Maggot	
Riffle Beetle		Crane Fly Larvae					
Water Penny	30	Clams/Mussels					
Right-Handed Snail		Crayfish	2				
# of TAXA	3	# of TAXA	2	# of TAXA	2	# of TAXA	2
Weighting Factors: (x 4)	12	(x 3)	6	(x 2)	4	(x 1)	2

23 or More	Excellent
17 - 22	Good
11 - 16	Fair
10 or Less	Poor

POLLUTION TOLERANCE INDEX RATING
(Add the final index values for each group.) 24 Excellent!

BIOLOGICAL MONITORING DATA SHEET

Date ____/____/____ (MM DD YY) Begin Time _____:_____ (am/pm) # Adults _____

End Time _____:_____ (am/pm) # Students _____

Certified Monitors' Names_____ Volunteer ID_____

Organization Name _____

Watershed Name _____ Watershed # __ __ __ __ __ __ __ __

Stream/River Name _____ Site ID _____

(Please do not abbreviate.) (Above ID numbers are required.)

Check Methods Used

- ☐ Kick Seine Net (3 times)
- ☐ D-Net (20 jabs or scoops)

Check Habitats Sampled

- ☐ Riffles
- ☐ Leaf Packs
- ☐ Undercut Banks
- ☐ Snags/Vegetation
- ☐ Sediment
- ☐ Other

POLLUTION TOLERANCE INDEX (PTI)

PT GROUP 1 *Intolerant*		PT GROUP 2 *Moderately Intolerant*		PT GROUP 3 *Fairly Tolerant*		PT GROUP 4 *Very Tolerant*	
Stonefly Nymph	_____	Damselfly Nymph	_____	Midges	_____	Left-Handed Snail	_____
Mayfly Nymph	_____	Dragonfly Nymph	_____	Black Fly Larvae	_____	Aquatic Worms	_____
Caddis Fly Larvae	_____	Sowbug	_____	Planaria	_____	Blood Midge	_____
Dobsonfly Larvae	_____	Scud	_____	Leech	_____	Rat-tailed Maggot	_____
Riffle Beetle	_____	Crane Fly Larvae	_____				
Water Penny	_____	Clams/Mussels	_____				
Right-Handed Snail	_____	Crayfish	_____				
# Of TAXA	_____	**# Of TAXA**	_____	**# Of TAXA**	_____	**# Of TAXA**	_____
Weighting Factors: **(x 4)**	_____	**(x 3)**	_____	**(x 2)**	_____	**(x 1)**	_____

23 or More	**Excellent**
17 - 22	**Good**
11 - 16	**Fair**
10 or Less	**Poor**

POLLUTION TOLERANCE INDEX RATING

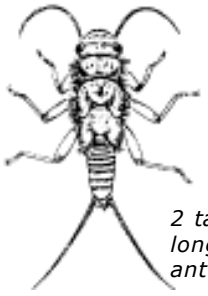
(Add the final index values for each group.)

Other Biological Indicators

☐ Native Mussels ☐ Zebra Mussels ☐ Rusty Crayfish ☐ Aquatic Plants _____ % Algae Cover _____ Diversity Index

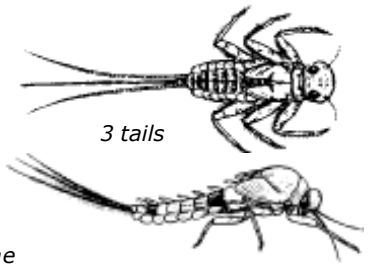
Macroinvertebrate Identification Key

GROUP 1 – Very Intolerant of Pollution



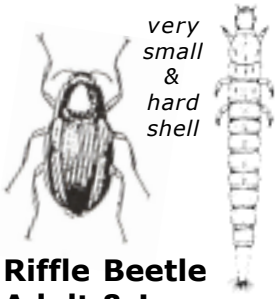
2 tails long antennae

Stonefly Nymph



3 tails

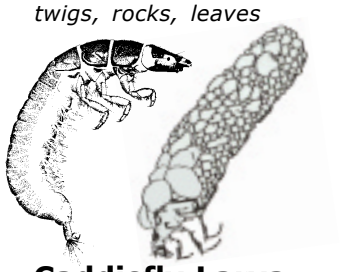
Mayfly Nymph



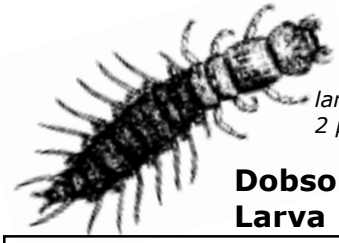
very small & hard shell

Riffle Beetle Adult & Larva

makes a case from twigs, rocks, leaves



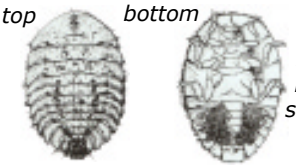
Caddisfly Larva



large head & 2 pinchers

Dobsonfly Larva

top *bottom*



looks like a suction cup

Water Penny Larva

Right-Handed Snail

must be alive to count

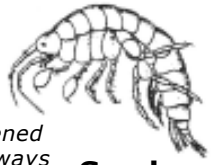
GROUP 2 – Moderately Intolerant of Pollution

3 paddle-like (feathery) tails

Damselfly Nymph

Dragonfly Nymph

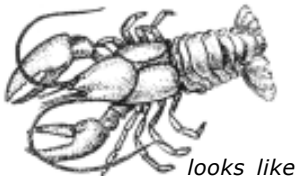
no tails large eyes



flattened side-ways & swims on side

Scud

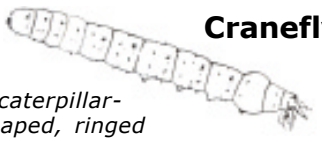
Crayfish



looks like a mini-lobster

Sowbug

flattened top to bottom (looks like a pill bug)



Cranefly

caterpillar-shaped, ringed

must be alive to count

Clam/Mussel

GROUP 3 – Fairly Tolerant of Pollution

Midge Larva

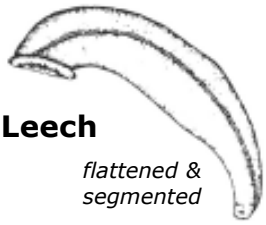
small, but visible head intense wiggler

Planaria

2 eye spots & very small

one end is swollen

Black Fly Larva

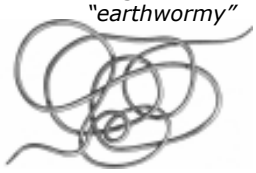


Leech

flattened & segmented

GROUP 4 – Very Tolerant of Pollution

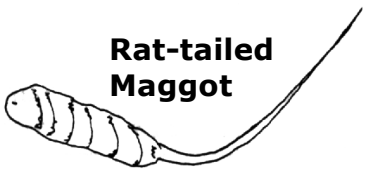
segmented "earthwormy"



Aquatic Worms

must be alive to count

Left-Handed Snail



Rat-tailed Maggot

bright red

Blood Midge Larva